

## Claims

- [c1] 1. A phosphor blend comprising at least two phosphors, each of said phosphors being selected from one of groups: (a)  $(\text{Ba}, \text{Sr}, \text{Ca})_5 (\text{PO}_4)_3 (\text{Cl}, \text{F}, \text{OH}) : \text{Eu}^{2+}$ ,  $(\text{Ba}, \text{Sr}, \text{Ca})\text{MgAl}_{10} \text{O}_{17} : \text{Eu}^{2+}$ , and  $(\text{Ba}, \text{Sr}, \text{Ca})\text{BPO}_5 : \text{Eu}^{2+}$ ; (b)  $\text{Sr}_2 \text{Al}_2 \text{O}_7 : \text{Eu}^{2+}$ ,  $\text{BaAl}_8 \text{O}_{13} : \text{Eu}^{2+}$ ,  $2\text{SrO} \cdot 0.84\text{P}_2\text{O}_5 \cdot 0.16\text{B}_2\text{O}_3 : \text{Eu}^{2+}$ ,  $\text{MgWO}_4$ ,  $\text{BaTiP}_2 \text{O}_8$ ,  $(\text{Ba}, \text{Sr}, \text{Ca})\text{MgAl}_{10} \text{O}_{17} : \text{Eu}^{2+}$ ,  $\text{Mn}^{2+}$ , and  $(\text{Ba}, \text{Sr}, \text{Ca})_3 (\text{PO}_4)_2 (\text{Cl}, \text{F}, \text{OH}) : \text{Sb}^{3+}$ ; (c)  $\text{LaPO}_4 : \text{Ce}^{3+}$ ,  $\text{Tb}^{3+}$ ,  $\text{CeMgAl}_{11} \text{O}_{19} : \text{Tb}^{3+}$ ,  $\text{GdMgB}_5 \text{O}_{10} : \text{Ce}^{3+}$ ,  $\text{Tb}^{3+}$ ,  $\text{Mn}^{2+}$ , and  $\text{GdMgB}_5 \text{O}_{10} : \text{Ce}^{3+}$ ,  $\text{Tb}^{3+}$ ; (d)  $(\text{Tb}, \text{Y}, \text{Lu}, \text{La}, \text{Gd})_x (\text{Al}, \text{Ga})_y \text{O}_{12} : \text{Ce}^{3+}$ , wherein x is in a range from about 2.8 to and including 3 and y is in a range from about 4 to and including 5, and  $(\text{Ba}, \text{Sr}, \text{Ca})_5 (\text{PO}_4)_3 (\text{Cl}, \text{F}, \text{OH}) : \text{Eu}^{2+}$ ,  $\text{Mn}^{2+}$ ,  $\text{Sb}^{3+}$ ; (e)  $(\text{Y}, \text{Gd}, \text{La}, \text{Lu}, \text{Sc})_2 \text{O}_3 : \text{Eu}^{3+}$ ,  $(\text{Y}, \text{Gd}, \text{La}, \text{In}, \text{Lu}, \text{Sc})\text{BO}_3 : \text{Eu}^{3+}$ ,  $(\text{Y}, \text{Gd}, \text{La})(\text{Al}, \text{Ga})\text{O}_3 : \text{Eu}^{3+}$ ,  $(\text{Ba}, \text{Sr}, \text{Ca})(\text{Y}, \text{Gd}, \text{La}, \text{Lu})_2 \text{O}_4 : \text{Eu}^{3+}$ ,  $(\text{Y}, \text{Gd})\text{Al}_3 \text{B}_4 \text{O}_{12} : \text{Eu}^{3+}$ , monoclinic  $\text{Gd}_2 \text{O}_3 : \text{Eu}^{3+}$ ,  $(\text{Gd}, \text{Y})_4 (\text{Al}, \text{Ga})_2 \text{O}_9 : \text{Eu}^{3+}$ ,  $(\text{Ca}, \text{Sr})(\text{Gd}, \text{Y})_3 (\text{Ge}, \text{Si})\text{Al}_3 \text{O}_9 : \text{Eu}^{3+}$ ,  $(\text{Sr}, \text{Mg})_3 (\text{PO}_4)_2 : \text{Sn}^{2+}$ , and  $\text{GdMgB}_5 \text{O}_{10} : \text{Ce}^{3+}$ ,  $\text{Mn}^{2+}$ ; and (f)  $3.5\text{MgO} \cdot 0.5\text{MgF}_2 \cdot \text{GeO}_2 : \text{Mn}^{4+}$ ; wherein at least two phosphors are selected from different groups, and said phosphor blend is capable of absorbing electromagnetic ("EM") radiation having wavelengths in a range from about 200 nm to about 400 nm and emitting light in having wavelengths in a visible spectrum.
- [c2] 2. The phosphor blend of claim 1, wherein said phosphor blend absorbs EM radiation substantially in a wavelength range from about 250 nm to about 350 nm.
- [c3] 3. The phosphor blend of claim 1, wherein said phosphor blend absorbs EM radiation substantially in a wavelength range from about 250 nm to about 300 nm.
- [c4] 4. The phosphor blend of claim 1, wherein said light emitted from said phosphor blend is white light.
- [c5] 5. The phosphor blend of claim 4, wherein said white light has color coordinates substantially on a black body locus of a CIE chromaticity diagram.

[c6] 6.The phosphor blend of claim 5, wherein said color coordinates of said white light is represented by a point at a distance less than or equal to about 0.0054 from a black body locus of a CIE chromaticity diagram.

[c7] 7.The phosphor blend of claim 1, wherein  $y$  is in a range from about 4.5 to and including 5.

[c8] 8. The phosphor blend of claim 1, wherein  $y$  is in a range from about 4.6 to and including 5.

[c9] 9.A phosphor blend comprising  $(\text{Tb}, \text{Y}, \text{Lu}, \text{La}, \text{Gd})_x (\text{Al}, \text{Ga})_y \text{O}_{12} : \text{Ce}^{3+}$ , wherein  $x$  is in a range from about 2.8 to and including 3 and  $y$  is a range from about 4 to and including 5, and at least another phosphor selected from one of

groups: (a)  $(\text{Ba}, \text{Sr}, \text{Ca})_5 (\text{PO}_4)_3 (\text{Cl}, \text{F}, \text{OH}) : \text{Eu}^{2+}$ ,  $(\text{Ba}, \text{Sr}, \text{Ca}) \text{MgAl}_{10} \text{O}_{17} : \text{Eu}^{2+}$ , and  $(\text{Ba}, \text{Sr}, \text{Ca}) \text{BPO}_5 : \text{Eu}^{2+}$ ; (b)  $\text{Sr}_2 \text{Al}_{14} \text{O}_{25} : \text{Eu}^{2+}$ ,  $\text{BaAl}_8 \text{O}_{13} : \text{Eu}^{2+}$ ,  $2\text{SrO} \cdot 0.84\text{P}_2\text{O}_5 \cdot 0.16\text{B}_2\text{O}_3 : \text{Eu}^{2+}$ ,  $\text{MgWO}_4$ ,  $\text{BaTiP}_2 \text{O}_8$ ,  $(\text{Ba}, \text{Sr}, \text{Ca}) \text{MgAl}_{10} \text{O}_{17} : \text{Eu}^{2+}$ ,  $\text{Mn}^{2+}$ , and  $(\text{Ba}, \text{Sr}, \text{Ca})_3 (\text{PO}_4)_2 (\text{Cl}, \text{F}, \text{OH}) : \text{Sb}^{3+}$ ; (c)  $\text{LaPO}_4 : \text{Ce}^{3+}$ ,  $\text{Tb}^{3+}$ ,  $\text{CeMgAl}_{11} \text{O}_{19} : \text{Tb}^{3+}$ ,  $\text{GdMgB}_5 \text{O}_{10} : \text{Ce}^{3+}$ ,  $\text{Tb}^{3+}$ ,  $\text{Mn}^{2+}$ , and  $\text{GdMgB}_5 \text{O}_{10} : \text{Ce}^{3+}$ ,  $\text{Tb}^{3+}$ ; (d)  $(\text{Y}, \text{Gd}, \text{La}, \text{Lu}, \text{Sc})_2 \text{O}_3 : \text{Eu}^{3+}$ ,  $(\text{Y}, \text{Gd}, \text{La}, \text{In}, \text{Lu}, \text{Sc}) \text{BO}_3 : \text{Eu}^{3+}$ ,  $(\text{Y}, \text{Gd}, \text{La}) (\text{Al}, \text{Ga}) \text{O}_3 : \text{Eu}^{3+}$ ,  $(\text{Ba}, \text{Sr}, \text{Ca}) (\text{Y}, \text{Gd}, \text{La}, \text{Lu})_2 \text{O}_4 : \text{Eu}^{3+}$ ,  $(\text{Y}, \text{Gd}) \text{Al}_3 \text{B}_4 \text{O}_{12} : \text{Eu}^{3+}$ , monoclinic  $\text{Gd}_2 \text{O}_3 : \text{Eu}^{3+}$ ,  $(\text{Gd}, \text{Y})_4 (\text{Al}, \text{Ga})_2 \text{O}_9 : \text{Eu}^{3+}$ ,  $(\text{Ca}, \text{Sr}) (\text{Gd}, \text{Y}) (\text{Ge}, \text{Si}) \text{Al}_3 \text{O}_9 : \text{Eu}^{3+}$ ,  $(\text{Sr}, \text{Mg})_3 (\text{PO}_4)_2 : \text{Sn}^{2+}$ , and  $\text{GdMgB}_5 \text{O}_{10} : \text{Ce}^{3+}$ ,  $\text{Mn}^{2+}$ ; and (e)  $3.5\text{MgO} \cdot 0.5\text{MgF}_2 \cdot \text{GeO}_2 : \text{Mn}^{4+}$ ; wherein said phosphor blend is capable of absorbing EM radiation having wavelengths in a range from about 200 nm to about 400 nm and emitting light in having wavelengths in a visible spectrum.

[c10] 10.The phosphor blend of claim 9, wherein said phosphor blend absorbs EM radiation substantially in a wavelength range from about 250 nm to about 350 nm.

[c11] 11.The phosphor blend of claim 9, wherein said phosphor blend absorbs EM radiation substantially in a wavelength range from about 250 nm to about 300 nm.

[c12] 12.The phosphor blend of claim 11, wherein said white light has color

coordinates substantially on a black body locus of a CIE chromaticity diagram.

[c13] 13.The phosphor blend of claim 11, wherein said color coordinates of said white light is represented by a point at a distance less than or equal to about 0.0054 from a black body locus of a CIE chromaticity diagram.

[c14] 14.The phosphor blend of claim 9, wherein said light emitted from said phosphor blend is white light.

[c15] 15.The phosphor blend of claim 9, wherein y is in a range from about 4.5 to including 5.

[c16] 16. The phosphor blend of claim 9, wherein y is in a range from about 4.6 to and including 5.

[c17] 17.A phosphor blend comprising a plurality of phosphors, each of said phosphors being selected from one of groups: (a)  $(\text{Ba,Sr,Ca})_5(\text{PO}_4)_3$   $(\text{Cl,F,OH})\text{:Eu}^{2+}$ ,  $(\text{Ba,Sr,Ca})\text{MgAl}_{10}\text{O}_{17}\text{:Eu}^{2+}$ , and  $(\text{Ba,Sr,Ca})\text{BPO}_5\text{:Eu}^{2+}$ ; (b)  $\text{Sr}_2\text{Al}_{14}\text{O}_{25}\text{:Eu}^{2+}$ ,  $\text{BaAl}_8\text{O}_{13}\text{:Eu}^{2+}$ ,  $2\text{SrO} \cdot 0.84\text{P}_2\text{O}_5 \cdot 0.16\text{B}_2\text{O}_3\text{:Eu}^{2+}$ ,  $\text{MgWO}_4$ ,  $\text{BaTiP}_2\text{O}_8$ ,  $(\text{Ba,Sr,Ca})\text{MgAl}_{10}\text{O}_{17}\text{:Eu}^{2+}$ ,  $\text{Mn}^{2+}$ , and  $(\text{Ba,Sr,Ca})_5(\text{PO}_4)_3(\text{Cl,F,OH})\text{:Sb}^{3+}$ ; (c)  $(\text{Tb,Y,Lu,La,Gd})_x(\text{Al,Ga})_y\text{O}_{12}\text{:Ce}^{3+}$ , wherein x is a range from about 2.8 to and including 3 and y is in a range from about 4 to and including 5, and  $(\text{Ba,Sr,Ca})_5(\text{PO}_4)_3(\text{Cl,F,OH})\text{:Eu}^{2+}$ ,  $\text{Mn}^{2+}$ ,  $\text{Sb}^{3+}$ ; and (d)  $(\text{Y,Gd,La,Lu,Sc})_2\text{O}_3\text{:Eu}^{3+}$ ,  $(\text{Y,Gd,La,In,Lu,Sc})\text{BO}_3\text{:Eu}^{3+}$ ,  $(\text{Y,Gd,La})(\text{Al,Ga})\text{O}_3\text{:Eu}^{3+}$ ,  $(\text{Ba,Sr,Ca})(\text{Y,Gd,La,Lu})_2\text{O}_4\text{:Eu}^{3+}$ ,  $(\text{Y,Gd})\text{Al}_3\text{B}_4\text{O}_{12}\text{:Eu}^{3+}$ , monoclinic  $\text{Gd}_2\text{O}_3\text{:Eu}^{3+}$ ,  $(\text{Gd,Y})_4(\text{Al,Ga})_9\text{O}_{27}\text{:Eu}^{3+}$ ,  $(\text{Ca,Sr})(\text{Gd,Y})_3(\text{Ge,Si})\text{Al}_3\text{O}_9\text{:Eu}^{3+}$ ,  $(\text{Sr,Mg})_3(\text{PO}_4)_2\text{:Sn}^{2+}$ , and  $\text{GdMgB}_5\text{O}_{10}\text{:Ce}^{3+}$ ,  $\text{Mn}^{2+}$ ; wherein at least two of said phosphors are selected from different groups, and said phosphor blend is capable of absorbing EM radiation having wavelengths in a range from about 200 nm to about 400 nm and emitting light in having wavelengths in a visible spectrum.

[c18] 18.The phosphor blend of claim 17, wherein y is in a range from about 4.5 to and including 5.

[c19] 19. The phosphor blend of claim 17, wherein y is in a range from about 4.6 to

and including 5.

[c20] 20.A phosphor blend comprising phosphors, each of said phosphors being selected from one of the groups: (a)  $(\text{Ba,Sr,Ca})_5(\text{PO}_4)_3(\text{Cl,F,OH})\text{:Eu}^{2+}$ ,  $(\text{Ba,Sr,Ca})\text{MgAl}_{10}\text{O}_{17}\text{:Eu}^{2+}$ , and  $(\text{Ba,Sr,Ca})\text{BPO}_5\text{:Eu}^{2+}$ ; (b)  $\text{Sr}_2\text{Al}_2\text{O}_7\text{:Eu}^{2+}$ ,  $\text{BaAl}_8\text{O}_{13}\text{:Eu}^{2+}$ ,  $2\text{SrO} \cdot 0.84\text{P}_2\text{O}_5 \cdot 0.16\text{B}_2\text{O}_3\text{:Eu}^{2+}$ ,  $\text{MgWO}_4$ ,  $\text{BaTiP}_2\text{O}_8$ ,  $(\text{Ba,Sr,Ca})\text{MgAl}_{10}\text{O}_{17}\text{:Eu}^{2+}$ ,  $\text{Mn}^{2+}$ , and  $(\text{Ba,Sr,Ca})_5(\text{PO}_4)_3(\text{Cl,F,OH})\text{:Sb}^{3+}$ ; and (c)  $(\text{Tb,Y,Lu,La,Gd})_x(\text{Al,Ga})_y\text{O}_{12}\text{:Ce}^{3+}$ ,  $(\text{Ba,Sr,Ca})_5(\text{PO}_4)_3(\text{Cl,F,OH})\text{:Eu}^{2+}$ ,  $\text{Mn}^{2+}$ ,  $\text{Sb}^{3+}$ ; wherein x is in a range from about 2.8 to and including 3, y is in a range from about 4 to and including 5, at least two phosphors are selected from different groups, and said phosphor blend is capable of absorbing EM radiation having wavelengths in a range from about 200 nm to about 400 nm and emitting light in having wavelengths in a visible spectrum.

[c21] 21.The phosphor blend of claim 20, wherein y is in a range from about 4.5 to and including 5.

[c22] 22. The phosphor blend of claim 20, wherein y is in a range from about 4.6 to and including 5.

[c23] 23.A phosphor blend comprising phosphors, each of said phosphors being selected from one of groups: (a)  $(\text{Ba,Sr,Ca})_5(\text{PO}_4)_3(\text{Cl,F,OH})\text{:Eu}^{2+}$ ,  $(\text{Ba,Sr,Ca})\text{MgAl}_{10}\text{O}_{17}\text{:Eu}^{2+}$ , and  $(\text{Ba,Sr,Ca})\text{BPO}_5\text{:Eu}^{2+}$ ; (b)  $\text{LaPO}_4\text{:Ce}^{3+}$ ,  $\text{Tb}^{3+}$ ,  $\text{CeMgAl}_{11}\text{O}_{19}\text{:Tb}^{3+}$ ,  $\text{GdMgB}_5\text{O}_{10}\text{:Ce}^{3+}$ ,  $\text{Tb}^{3+}$ ,  $\text{Mn}^{2+}$ , and  $\text{GdMgB}_5\text{O}_{10}\text{:Ce}^{3+}$ ,  $\text{Tb}^{3+}$ ; (c)  $(\text{Tb,Y,Lu,La,Gd})_x(\text{Al,Ga})_y\text{O}_{12}\text{:Ce}^{3+}$  and  $(\text{Ba,Sr,Ca})_5(\text{PO}_4)_3(\text{Cl,F,OH})\text{:Eu}^{2+}$ ,  $\text{Mn}^{2+}$ ,  $\text{Sb}^{3+}$ ; and (d)  $(\text{Y,Gd,La,Lu,Sc})_2\text{O}_3\text{:Eu}^{3+}$ ,  $(\text{Y,Gd,La,In,Lu,Sc})\text{BO}_3\text{:Eu}^{3+}$ ,  $(\text{Y,Gd,La})(\text{Al,Ga})\text{O}_3\text{:Eu}^{3+}$ ,  $(\text{Ba,Sr,Ca})(\text{Y,Gd,La,Lu})_2\text{O}_4\text{:Eu}^{3+}$ ,  $(\text{Y,Gd})\text{Al}_3\text{B}_4\text{O}_{12}\text{:Eu}^{3+}$ , monoclinic  $\text{Gd}_2\text{O}_3\text{:Eu}^{3+}$ ,  $(\text{Gd,Y})_4(\text{Al,Ga})_9\text{O}_{22}\text{:Eu}^{3+}$ ,  $(\text{Ca,Sr})(\text{Gd,Y})(\text{Ge,Si})\text{Al}_3\text{O}_9\text{:Eu}^{3+}$ , and  $(\text{Sr,Mg})_3(\text{PO}_4)_2\text{:Sn}^{2+}$ ,  $\text{GdMgB}_5\text{O}_{10}\text{:Ce}^{3+}$ ,  $\text{Mn}^{2+}$ ; wherein x is in a range from about 2.8 to and including 3, y is in a range from about 4 to and including 5, at least two phosphors are selected from different groups, and said phosphor blend is capable of absorbing EM radiation having wavelengths in a range from about 200 nm to about 400 nm and emitting light in having

wavelengths in a visible spectrum.

[c24] 24.The phosphor blend of claim 23, wherein y is in a range from about 4.5 to and including 5.

[c25] 25.The phosphor blend of claim 23, wherein y is in a range from about 4.6 to and including 5.

[c26] 26.A phosphor blend comprising phosphors, each of said phosphors being selected from one of groups: (a)  $(\text{Ba,Sr,Ca})_5(\text{PO}_4)_3(\text{Cl,F,OH})\text{:Eu}^{2+}$ ,  $(\text{Ba,Sr,Ca})\text{MgAl}_{10}\text{O}_{17}\text{:Eu}^{2+}$ , and  $(\text{Ba,Sr,Ca})\text{BPO}_5\text{:Eu}^{2+}$ ; (b)  $(\text{Tb,Y,Lu,La,Gd})_x(\text{Al,Ga})_y\text{O}_{12}\text{:Ce}^{3+}$  and  $(\text{Ba,Sr,Ca})_5(\text{PO}_4)_3(\text{Cl,F,OH})\text{:Eu}^{2+}$ ,  $\text{Mn}^{2+}$ ,  $\text{Sb}^{3+}$ ; (c)  $(\text{Y,Gd,La,Lu,Sc})_2\text{O}_3\text{:Eu}^{3+}$ ,  $(\text{Y,Gd,La,In,Lu,Sc})\text{BO}_3\text{:Eu}^{3+}$ ,  $(\text{Y,Gd,La})_3(\text{Al,Ga})\text{O}_3\text{:Eu}^{3+}$ ,  $(\text{Ba,Sr,Ca})(\text{Y,Gd,La,Lu})_2\text{O}_4\text{:Eu}^{3+}$ ,  $(\text{Y,Gd})\text{Al}_3\text{B}_4\text{O}_{12}\text{:Eu}^{3+}$ , monoclinic  $\text{Gd}_2\text{O}_3\text{:Eu}^{3+}$ ,  $(\text{Gd,Y})_4(\text{Al,Ga})_2\text{O}_9\text{:Eu}^{3+}$ ,  $(\text{Ca,Sr})(\text{Gd,Y})_3(\text{Ge,Si})\text{Al}_3\text{O}_9\text{:Eu}^{3+}$ , and  $(\text{Sr,Mg})_3(\text{PO}_4)_2\text{:Sn}^{2+}$ ,  $\text{GdMgB}_5\text{O}_{10}\text{:Ce}^{3+}$ ,  $\text{Mn}^{2+}$ ; and (d)  $3.5\text{MgO}0.5\text{MgF}_2\text{GeO}_2\text{:Mn}^{4+}$ ; wherein x is in a range from about 2.8 to and including 3, y is in a range from about 4 to and including 5, at least two phosphors are selected from different groups, and said phosphor blend is capable of absorbing EM radiation having wavelengths in a range from about 200 nm to about 400 nm and emitting light in having wavelengths in a visible spectrum.

[c27] 27.The phosphor blend of claim 26, wherein y is in a range from about 4.5 to and including 5.

[c28] 28.The phosphor blend of claim 26, wherein y is in a range from about 4.6 to and including 5.

[c29] 29.A phosphor blend comprising phosphors, each of said phosphors being selected from one of groups: (a)  $(\text{Ba,Sr,Ca})_5(\text{PO}_4)_3(\text{Cl,F,OH})\text{:Eu}^{2+}$ ,  $(\text{Ba,Sr,Ca})\text{MgAl}_{10}\text{O}_{17}\text{:Eu}^{2+}$ , and  $(\text{Ba,Sr,Ca})\text{BPO}_5\text{:Eu}^{2+}$ ; (b)  $(\text{Tb,Y,Lu,La,Gd})_x(\text{Al,Ga})_y\text{O}_{12}\text{:Ce}^{3+}$  and  $(\text{Ba,Sr,Ca})_5(\text{PO}_4)_3(\text{Cl,F,OH})\text{:Eu}^{2+}$ ,  $\text{Mn}^{2+}$ ,  $\text{Sb}^{3+}$ ; and (c)  $3.5\text{MgO}0.5\text{MgF}_2\text{GeO}_2\text{:Mn}^{4+}$ ; wherein x is in a range from about 2.8 to and including 3, y is in a range from about 4 to and including 5, at least two phosphors are selected from different groups, and said phosphor

blend is capable of absorbing EM radiation having wavelengths in a range from about 200 nm to about 400 nm and emitting light in having wavelengths in a visible spectrum.

[c30] 30. The phosphor blend of claim 29, wherein  $y$  is in a range from about 4.5 to and including 5.

[c31] 31. The phosphor blend of claim 29, wherein  $y$  is in a range from about 4.6 to and including 5.

[c32] 32. A light source comprising:

(a) a source of gas discharge; and

(b) a phosphor blend comprising at least two phosphors, each of said phosphors

being selected from one of groups: (1)  $(\text{Ba}, \text{Sr}, \text{Ca})_5 (\text{PO}_4)_3 (\text{Cl}, \text{F}, \text{OH}) : \text{Eu}^{2+}$ ,  $(\text{Ba}, \text{Sr}, \text{Ca})\text{MgAl}_{10} \text{O}_{17} : \text{Eu}^{2+}$ , and  $(\text{Ba}, \text{Sr}, \text{Ca})\text{BPO}_5 : \text{Eu}^{2+}$ ; (2)  $\text{Sr}_2 \text{Al}_2 \text{O}_7 : \text{Eu}^{2+}$ ,  $\text{BaAl}_8 \text{O}_{13} : \text{Eu}^{2+}$ ,  $2\text{SrO} \cdot 0.84\text{P}_2\text{O}_5 \cdot 0.16\text{B}_2\text{O}_3 : \text{Eu}^{2+}$ ,  $\text{MgWO}_4$ ,  $\text{BaTiP}_2 \text{O}_8$ ,  $(\text{Ba}, \text{Sr}, \text{Ca})\text{MgAl}_{10} \text{O}_{17} : \text{Eu}^{2+}$ ,  $\text{Mn}^{2+}$ , and  $(\text{Ba}, \text{Sr}, \text{Ca})_3 (\text{PO}_4)_4 (\text{Cl}, \text{F}, \text{OH}) : \text{Sb}^{3+}$ ; (3)  $\text{LaPO}_4 : \text{Ce}^{3+}$ ,  $\text{Tb}^{3+}$ ,  $\text{CeMgAl}_{11} \text{O}_{19} : \text{Tb}^{3+}$ ,  $\text{GdMgB}_5 \text{O}_{10} : \text{Ce}^{3+}$ ,  $\text{Tb}^{3+}$ ,  $\text{Mn}^{2+}$ , and  $\text{GdMgB}_5 \text{O}_{10} : \text{Ce}^{3+}$ ,  $\text{Tb}^{3+}$ ; (4)  $(\text{Tb}, \text{Y}, \text{Lu}, \text{La}, \text{Gd})_2 (\text{Al}, \text{Ga})_3 \text{O}_{12} : \text{Ce}^{3+}$  and  $(\text{Ba}, \text{Sr}, \text{Ca})_5 (\text{PO}_4)_3 (\text{Cl}, \text{F}, \text{OH}) : \text{Eu}^{2+}$ ,  $\text{Mn}^{2+}$ ,  $\text{Sb}^{3+}$ ; (5)  $(\text{Y}, \text{Gd}, \text{La}, \text{Lu}, \text{Sc})_2 \text{O}_3 : \text{Eu}^{3+}$ ,  $(\text{Y}, \text{Gd}, \text{La}, \text{In}, \text{Lu}, \text{Sc})\text{BO}_3 : \text{Eu}^{3+}$ ,  $(\text{Y}, \text{Gd}, \text{La})(\text{Al}, \text{Ga})\text{O}_3 : \text{Eu}^{3+}$ ,  $(\text{Ba}, \text{Sr}, \text{Ca})(\text{Y}, \text{Gd}, \text{La}, \text{Lu})_2 \text{O}_4 : \text{Eu}^{3+}$ ,  $(\text{Y}, \text{Gd})\text{Al}_3 \text{B}_4 \text{O}_{12} : \text{Eu}^{3+}$ , monoclinic  $\text{Gd}_2 \text{O}_3 : \text{Eu}^{3+}$ ,  $(\text{Gd}, \text{Y})_4 (\text{Al}, \text{Ga})_2 \text{O}_9 : \text{Eu}^{3+}$ ,  $(\text{Ca}, \text{Sr})(\text{Gd}, \text{Y})_3 (\text{Ge}, \text{Si})\text{Al}_3 \text{O}_9 : \text{Eu}^{2+}$ ,  $(\text{Sr}, \text{Mg})_3 (\text{PO}_4)_2 : \text{Sn}^{2+}$ , and  $\text{GdMgB}_5 \text{O}_{10} : \text{Ce}^{3+}$ ,  $\text{Mn}^{2+}$ ; and (6)  $3.5\text{MgO} \cdot 0.5\text{MgF}_2 \cdot \text{GeO}_2 : \text{Mn}^{4+}$ ; wherein  $x$  is in a range from about 2.8 to and including 3,  $y$  is in a range from about 4 to and including 5, at least two phosphors are selected from different groups, and said phosphor blend is capable of absorbing EM radiation that is emitted by said source of gas discharge and has wavelengths in a range from about 200 nm to about 400 nm and emitting light in having wavelengths in a visible spectrum.

[c33] 33. The light source of claim 32, wherein  $y$  is in a range from about 4.5 to and including 5.

[c34] 34. The light source of claim 32, wherein  $y$  is in a range from about 4.6 to and including 5.

including 5.

[c35] 35.The light source of claim 32, wherein said source of gas discharge is a mercury vapor discharge.

[c36] 36.A light source comprising:

(a)a source of gas discharge; and

(b)a phosphor blend comprising (Tb,Y,Lu,La,Gd) (Al,Ga) O<sub>12</sub>:Ce<sup>3+</sup> and at least another phosphor selected from one of the groups: (1) (Ba,Sr,Ca)<sub>5</sub>(PO<sub>4</sub>)<sub>3</sub>(Cl,F,OH):Eu<sup>2+</sup>, (Ba,Sr,Ca)MgAl<sub>10</sub>O<sub>17</sub>:Eu<sup>2+</sup>, and (Ba,Sr,Ca)BPO<sub>5</sub>:Eu<sup>2+</sup>; (2) Sr<sub>4</sub>Al<sub>14</sub>O<sub>25</sub>:Eu<sup>2+</sup>, BaAl<sub>8</sub>O<sub>13</sub>:Eu<sup>2+</sup>, 2SrO0.84P<sub>2</sub>O<sub>5</sub>0.16B<sub>2</sub>O<sub>3</sub>:Eu<sup>2+</sup>, MgWO<sub>4</sub>, BaTiP<sub>2</sub>O<sub>8</sub>, (Ba,Sr,Ca)MgAl<sub>10</sub>O<sub>17</sub>:Eu<sup>2+</sup>, Mn<sup>2+</sup>, and (Ba,Sr,Ca)<sub>5</sub>(PO<sub>4</sub>)<sub>3</sub>(Cl,F,OH):Sb<sup>3+</sup>; (3) LaPO<sub>4</sub>:Ce<sup>3+</sup>, Tb<sup>3+</sup>, CeMgAl<sub>10</sub>O<sub>19</sub>:Tb<sup>3+</sup>, GdMgB<sub>5</sub>O<sub>10</sub>:Ce<sup>3+</sup>, Tb<sup>3+</sup>, Mn<sup>4+</sup>, and GdMgB<sub>5</sub>O<sub>10</sub>:Ce<sup>3+</sup>, Tb<sup>3+</sup>; (4) (Y,Gd,La,Lu,Sc)<sub>2</sub>O<sub>3</sub>:Eu<sup>3+</sup>, (Y,Gd,La,In,Lu,Sc)BO<sub>3</sub>:Eu<sup>3+</sup>, (Y,Gd,La)(Al,Ga)O<sub>3</sub>:Eu<sup>3+</sup>, (Ba,Sr,Ca)(Y,Gd,La,Lu)<sub>2</sub>O<sub>4</sub>:Eu<sup>3+</sup>, (Y,Gd)Al<sub>3</sub>B<sub>4</sub>O<sub>12</sub>:Eu<sup>3+</sup>, monoclinic Gd<sub>2</sub>O<sub>3</sub>:Eu<sup>3+</sup>, (Gd,Y)<sub>4</sub>(Al,Ga)<sub>2</sub>O<sub>9</sub>:Eu<sup>3+</sup>, (Ca,Sr)(Gd,Y)<sub>3</sub>(Ge,Si)Al<sub>3</sub>O<sub>9</sub>:Eu<sup>3+</sup>, (Sr,Mg)<sub>3</sub>(PO<sub>4</sub>)<sub>2</sub>:Sn<sup>2+</sup>, and GdMgB<sub>5</sub>O<sub>10</sub>:Ce<sup>3+</sup>, Mn<sup>2+</sup>; and (5) 3.5MgO0.5MgF<sub>2</sub>GeO<sub>2</sub>:Mn<sup>4+</sup>; wherein x is in a range from about 2.8 to and including 3, y is in a range from about 4 to and including 5, said phosphor blend is capable of absorbing EM radiation that is emitted by said source of gas discharge and has wavelengths in a range from about 200 nm to about 400 nm and emitting light in having wavelengths in a visible spectrum.

[c37] 37.The light source of claim 36, wherein y is in a range from about 4.5 to and including 5.

[c38] 38.The light source of claim 36, wherein y is in a range from about 4.6 to and including 5.

[c39] 39.The light source of claim 36, wherein said source of gas discharge is a mercury vapor discharge.

[c40] 40.A light source comprising:  
(a)a source of gas discharge; and

(b) a phosphor blend comprising a plurality of phosphors, each of said phosphors being selected from one of groups: (1)  $(\text{Ba,Sr,Ca})_5(\text{PO}_4)_3(\text{Cl,F,OH})\text{:Eu}^{2+}$ ,  $(\text{Ba,Sr,Ca})\text{MgAl}_{10}\text{O}_{17}\text{:Eu}^{2+}$ , and  $(\text{Ba,Sr,Ca})\text{BPO}_5\text{:Eu}^{2+}$ ; (2)  $\text{Sr}_4\text{Al}_{14}\text{O}_{25}\text{:Eu}^{2+}$ ,  $\text{BaAl}_8\text{O}_{13}\text{:Eu}^{2+}$ ,  $2\text{SrO} \cdot 0.84\text{P}_2\text{O}_5 \cdot 0.16\text{B}_2\text{O}_3\text{:Eu}^{2+}$ ,  $\text{MgWO}_4$ ,  $\text{BaTiP}_2\text{O}_8$ ,  $(\text{Ba,Sr,Ca})\text{MgAl}_{10}\text{O}_{17}\text{:Eu}^{2+}$ ,  $\text{Mn}^{2+}$ , and  $(\text{Ba,Sr,Ca})_5(\text{PO}_4)_3(\text{Cl,F,OH})\text{:Sb}^{3+}$ ; (3)  $(\text{Tb,Y,Lu,La,Gd})_3(\text{Al,Ga})_y\text{O}_{12}\text{:Ce}^{3+}$  and  $(\text{Ba,Sr,Ca})_5(\text{PO}_4)_3(\text{Cl,F,OH})\text{:Eu}^{2+}$ ,  $\text{Mn}^{2+}$ ,  $\text{Sb}^{3+}$ ; and (4)  $(\text{Y,Gd,La,Lu,Sc})_2\text{O}_3\text{:Eu}^{3+}$ ,  $(\text{Y,Gd,La,In,Lu,Sc})\text{BO}_3\text{:Eu}^{3+}$ ,  $(\text{Y,Gd,La})(\text{Al,Ga})\text{O}_3\text{:Eu}^{3+}$ ,  $(\text{Ba,Sr,Ca})(\text{Y,Gd,La,Lu})_2\text{O}_4\text{:Eu}^{3+}$ ,  $(\text{Y,Gd})\text{Al}_3\text{B}_4\text{O}_{12}\text{:Eu}^{3+}$ , monoclinic  $\text{Gd}_2\text{O}_3\text{:Eu}^{3+}$ ,  $(\text{Gd,Y})_4(\text{Al,Ga})_2\text{O}_9\text{:Eu}^{3+}$ ,  $(\text{Ca,Sr})(\text{Gd,Y})_3(\text{Ge,Si})\text{Al}_2\text{O}_9\text{:Eu}^{3+}$ ,  $(\text{Sr,Mg})_3(\text{PO}_4)_2\text{:Sn}^{2+}$ , and  $\text{GdMgB}_5\text{O}_{10}\text{:Ce}^{3+}$ ,  $\text{Mn}^{2+}$ ; wherein x is in a range from about 2.8 to and including 3, y is in a range from about 4 to and including 5, at least two of said phosphors are selected from different groups, and said phosphor blend is capable of absorbing EM radiation having wavelengths in a range from about 200 nm to about 400 nm and emitting light in having wavelengths in a visible spectrum.

[c41] 41. The light source of claim 40, wherein y is in a range from about 4.5 to and including 5.

[c42] 42. The light source of claim 40, wherein y is in a range from about 4.6 to and including 5.

[c43] 43. The light source of claim 40, wherein said source of gas discharge is a mercury vapor discharge.

[c44] 44. A light source comprising:

(a) a source of gas discharge; and

(b) a phosphor blend comprising a plurality of phosphors, each of said phosphors being selected from one of groups: (1)  $(\text{Ba,Sr,Ca})_5(\text{PO}_4)_3(\text{Cl,F,OH})\text{:Eu}^{2+}$ ,  $(\text{Ba,Sr,Ca})\text{MgAl}_{10}\text{O}_{17}\text{:Eu}^{2+}$ , and  $(\text{Ba,Sr,Ca})\text{BPO}_5\text{:Eu}^{2+}$ ;

(2)  $\text{Sr}_4\text{Al}_{14}\text{O}_{25}\text{:Eu}^{2+}$ ,  $\text{BaAl}_8\text{O}_{13}\text{:Eu}^{2+}$ ,  $2\text{SrO} \cdot 0.84\text{P}_2\text{O}_5 \cdot 0.16\text{B}_2\text{O}_3\text{:Eu}^{2+}$ ,  $\text{MgWO}_4$ ,  $\text{BaTiP}_2\text{O}_8$ ,  $(\text{Ba,Sr,Ca})\text{MgAl}_{10}\text{O}_{17}\text{:Eu}^{2+}$ ,  $\text{Mn}^{2+}$ , and  $(\text{Ba,Sr,Ca})_5(\text{PO}_4)_3(\text{Cl,F,OH})\text{:Sb}^{3+}$ ; and (3)  $(\text{Tb,Y,Lu,La,Gd})_3(\text{Al,Ga})_y\text{O}_{12}\text{:Ce}^{3+}$  and  $(\text{Ba,Sr,Ca})_5(\text{PO}_4)_3(\text{Cl,F,OH})\text{:Eu}^{2+}$ ,  $\text{Mn}^{2+}$ ,  $\text{Sb}^{3+}$ ; wherein x



is in a range from about 2.8 to and including 3, y is in a range from about 4 to and including 5, at least two phosphors are selected from different groups, and said phosphor blend is capable of absorbing EM radiation having wavelengths in a range from about 200 nm to about 400 nm and emitting light in having wavelengths in a visible spectrum.

[c45] 45.The light source of claim 44, wherein y is in a range from about 4.5 to and including 5.

[c46] 46.The light source of claim 44, wherein y is in a range from about 4.6 to and including 5.

[c47] 47.The light source of claim 44, wherein said source of gas discharge is a mercury vapor discharge.

[c48] 48.A light source comprising:

(a)a source of gas discharge; and

(b)a phosphor blend comprising phosphors, each of said phosphors being

selected from one of groups: (1)  $(\text{Ba,Sr,Ca})_5(\text{PO}_4)_3(\text{Cl,F,OH})\text{:Eu}^{2+}$ ,  $(\text{Ba,Sr,Ca})\text{MgAl}_{10}\text{O}_{17}\text{:Eu}^{2+}$ , and  $(\text{Ba,Sr,Ca})\text{BPO}_5\text{:Eu}^{2+}$ ; (2)  $\text{LaPO}_4\text{:Ce}^{3+}$ ,  $\text{Tb}^{3+}$ ,  $\text{CeMgAl}_{11}\text{O}_{19}\text{:Tb}^{3+}$ ,  $\text{GdMgB}_5\text{O}_{10}\text{:Ce}^{3+}$ ,  $\text{Tb}^{3+}$ ,  $\text{Mn}^{2+}$ , and  $\text{GdMgB}_5\text{O}_{10}\text{:Ce}^{3+}$ ,  $\text{Tb}^{3+}$ ; (3)  $(\text{Tb,Y,Lu,La,Gd})_x(\text{Al,Ga})_y\text{O}_{12}\text{:Ce}^{3+}$ ,  $(\text{Ba,Sr,Ca})_5(\text{PO}_4)_3(\text{Cl,F,OH})\text{:Eu}^{2+}$ ,  $\text{Mn}^{2+}$ ,  $\text{Sb}^{3+}$ ; and (4)  $(\text{Y,Gd,La,Lu,Sc})_2\text{O}_3\text{:Eu}^{3+}$ ,  $(\text{Y,Gd,La,In,Lu,Sc})\text{BO}_3\text{:Eu}^{3+}$ ,  $(\text{Y,Gd,La})(\text{Al,Ga})\text{O}_3\text{:Eu}^{3+}$ ,  $(\text{Ba,Sr,Ca})(\text{Y,Gd,La,Lu})_2\text{O}_4\text{:Eu}^{3+}$ ,  $(\text{Y,Gd})\text{Al}_3\text{B}_4\text{O}_{12}\text{:Eu}^{3+}$ , monoclinic  $\text{Gd}_2\text{O}_3\text{:Eu}^{3+}$ ,  $(\text{Gd,Y})_4(\text{Al,Ga})_9\text{O}_{29}\text{:Eu}^{3+}$ ,  $(\text{Ca,Sr})(\text{Gd,Y})(\text{Ge,Si})\text{Al}_3\text{O}_9\text{:Eu}^{3+}$ ,  $(\text{Sr,Mg})_3(\text{PO}_4)_2\text{:Sn}^{2+}$ , and  $\text{GdMgB}_5\text{O}_{10}\text{:Ce}^{3+}$ ,  $\text{Mn}^{2+}$ ; wherein x is in a range from about 2.8 to and including 3, y is in a range from about 4 to and including 5, at least two phosphors are selected from different groups, and said phosphor blend is capable of absorbing EM radiation having wavelengths in a range from about 200 nm to about 400 nm and emitting light in having wavelengths in a visible spectrum.

[c49] 49.The light source of claim 48, wherein y is in a range from about 4.5 to and including 5.

[c50] 50.The light source of claim 48, wherein  $\gamma$  is in a range from about 4.6 to and including 5.

[c51] 51.The light source of claim 48, wherein said source of gas discharge is a mercury vapor discharge.

[c52] 52.A light source comprising:

(a)a source of gas discharge; and

(b)phosphor blend comprising phosphors, each of said phosphors being

selected from one of groups: (1)  $(\text{Ba,Sr,Ca})_5(\text{PO}_4)_3(\text{Cl,F,OH})\text{:Eu}^{2+}$ ,  $(\text{Ba,Sr,Ca})\text{MgAl}_{10}\text{O}_{17}\text{:Eu}^{2+}$ , and  $(\text{Ba,Sr,Ca})\text{BPO}_5\text{:Eu}^{2+}$ ; (2)  $(\text{Tb,Y,Lu,La,Gd})_x(\text{Al,Ga})_y\text{O}_{12}\text{:Ce}^{3+}$  and  $(\text{Ba,Sr,Ca})_5(\text{PO}_4)_3(\text{Cl,F,OH})\text{:Eu}^{2+}$ ,  $\text{Mn}^{2+}$ ,  $\text{Sb}^{3+}$ ; (3)  $(\text{Y,Gd,La,Lu,Sc})_2\text{O}_3\text{:Eu}^{3+}$ ,  $(\text{Y,Gd,La,In,Lu,Sc})\text{BO}_3\text{:Eu}^{3+}$ ,  $(\text{Y,Gd,La})_3(\text{Al,Ga})\text{O}_3\text{:Eu}^{3+}$ ,  $(\text{Ba,Sr,Ca})(\text{Y,Gd,La,Lu})_2\text{O}_4\text{:Eu}^{3+}$ ,  $(\text{Y,Gd})\text{Al}_3\text{B}_4\text{O}_{12}\text{:Eu}^{3+}$ , monoclinic  $\text{Gd}_2\text{O}_3\text{:Eu}^{3+}$ ,  $(\text{Gd,Y})_4(\text{Al,Ga})_2\text{O}_9\text{:Eu}^{3+}$ ,  $(\text{Ca,Sr})(\text{Gd,Y})_3(\text{Ge,Si})\text{Al}_3\text{O}_9\text{:Eu}^{3+}$ ,  $(\text{Sr,Mg})_3(\text{PO}_4)_2\text{:Sn}^{2+}$ , and  $\text{GdMgB}_5\text{O}_{10}\text{:Ce}^{3+}$ ,  $\text{Mn}^{2+}$ ; and (d)  $3.5\text{MgO}0.5\text{MgF}_2\text{GeO}_2\text{:Mn}^{4+}$ ; wherein  $x$  is in a range from about 2.8 to and including 3,  $y$  is in a range from about 4 to and including 5, at least two phosphors are selected from different groups, and said phosphor blend is capable of absorbing EM radiation having wavelengths in a range from about 200 nm to about 400 nm and emitting light in having wavelengths in a visible spectrum.

[c53] 53.The light source of claim 52, wherein  $\gamma$  is in a range from about 4.5 to and including 5.

[c54] 54. The light source of claim 52, wherein  $\gamma$  is in a range from about 4.6 to and including 5.

[c55] 55.The light source of claim 52, wherein said source of gas discharge is a mercury vapor discharge.

[c56] 56.The light source according to claim 32, wherein said light source has a CRI greater than about 80.

[c57] 57.The light source according to claim 36, wherein said light source has a CRI

greater than about 80.

[c58] 58.The light source according to claim 40, wherein said light source has a CRI greater than about 80.

[c59] 59.The light source according to claim 44, wherein said light source has a CRI greater than about 80.

[c60] 60.The light source according to claim 49, wherein said light source has a CRI greater than about 80.

[c61] 61.The light source according to claim 52, wherein said light source has a CRI greater than about 80.

[c62] 62.The light source according to claim 56, wherein said light source has a CRI greater than about 80 and a CCT in a range from about 2700 to about 6500 K.

[c63] 63.The light source according to claim 57, wherein said light source has a CRI greater than about 80 and a CCT in a range from about 2700 to about 6500 K.

[c64] 64.The light source according to claim 58, wherein said light source has a CRI greater than about 80 and a CCT in a range from about 2700 to about 6500 K.

[c65] 65.The light source according to claim 59, wherein said light source has a CRI greater than about 80 and a CCT in a range from about 2700 to about 6500 K.

[c66] 66.The light source according to claim 60, wherein said light source has a CRI greater than about 80 and a CCT in a range from about 2700 to about 6500 K.

[c67] 67.The light source according to claim 61, wherein said light source has a CRI greater than about 80 and a CCT in a range from about 2700 to about 6500 K.

10064129